ON THE

Combined Action of Cocaine and Atropine in Iritis.

BY

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In a paper on the Cocainised Eye, before the Ophthalmological Society on January 8th, 1885, I mentioned the use of the combination of cocaine and atropine in producing a very large dilatation of the pupil, and showed how this could be utilised in cases of iritis. Since then I have been trying how best to use such a combination, but the expense of the drug till lately has restricted me in the number of my cases. I first tried using cocaine at the hospital after the patient had been using atropine in the intervals of his visits, and hoping, perhaps, that the increased mydriasis produced might be kept up by the atropine used at home. A solution of atropine and cocaine was next tried when the patient could afford to pay for it, but finding how badly such a solution keeps, even with care, I gave it up for some discs which Messrs. Savory and Moore made for me. Those discs contain $\frac{1}{2\,6\,0}$ grain of cocaine hydrochlorate and $\frac{1}{3\,0\,0\,0}$ grain of atropine in each, and have answered all my requirements, being easy of application, constant in action, and very reliable. The following case in a healthy eye shows how quickly this combination produces an *ad maximum* dilatation of the pupil.

E. G——, aged six, pupils 5 mm., equal, act well to light and accommodation; 2.24 p.m., disc of cocaine and atropine in left eye; 2.29 p.m., no effect on pupil, slight

drooping of lower lid; 2.34 p.m., pupil 9 mm. when shaded, 6 mm. in bright light; 2.40 p.m. pupil 10 mm., acting very slightly to light and accommodation; 2.42 p.m., pupil 11 mm., does not act to light or accommodation. Therefore we have in eighteen minutes in this patient an *ad maximum* dilatation of the pupil. To test the difference in time and rapidity of dilatation of the pupil for the same amount of atropine, the following notes were taken on the same patient:—2.46 p.m., right eye, pupil 5 mm., disc of atropine ($\frac{1}{300}$ gr.) put in eye; 2.58 p.m., no effect; 3.4 p.m., no effect; 3.17 p.m., pupil 8 mm., does not act to light or accommodation; 3.22 p.m., pupil 9 mm.; 3.46 p.m., pupil 9·5 mm., and did not increase. Thus in eighteen minutes atropine had no effect, and in one hour the pupil was only 9.5 mm.

The following cases of iritis were treated at the Central London Ophthalmic Hospital.

Case 1.—B. B——, aged twenty-seven, was admitted Dec. 30th, 1884. Syphilitic iritis; rash eight weeks ago; left eye inflamed six days. Left eye: great ciliary congestion; iris discoloured; pupil 3·5 mm., irregular; on lower pupillary margin of iris is a gummatous mass; T + 1. Ordered instillation of atropine, four grains to the ounce; cantharides plaster, 1 in. by 1 in.; compress; and solution of perchloride of mercury, one drachm three times a day.—Jan. 2nd, 1885: Still in pain. Left eye: ciliary congestion; gumma of iris the same; pupil 7 mm.; irregular; tension + 1. Two instillations of cocaine, 4 per cent. solution; pupil 9 mm., and regular, except below where gummatous mass is; some uveal pigment on capsule of lens, where other synechiæ were; great relief of pain. This patient continued under the same treatment, the gumma becoming absorbed; and the pupil under cocaine and atropine 9 mm., regular, and no synechiæ to be seen even

where the gumma was. He had one relapse of the iritis on Feb. 20th, but this cleared up with the same treatment and on March 17th the note is :—Left eye: no congestion or pain; pupil 9 mm., a posterior synechia on the inner side, otherwise pupil quite regular; on lens capsule uveal pigment, especially below where the gumma was.

CASE 2.—E. G——, aged forty-two, admitted Jan. 3rd 1885. Rheumatic iritis; third attack. Has been under treatment with ointment of atropia, instillation of atropine four grains to the ounce, and leeches for three weeks, but is still in great pain. Left eye: circumcorneal zone, pupil 5 mm., dilated, posterior synechiæ on inner and under aspect: a little uveal pigment on inner side of pupil; T + ½. After three instillations of 2 per cent. solution of cocaine the circumcorneal zone of the left eye was much lessened; pupil 8·5 mm.; numerous other small synechiæ were seen all round, and also much uveal pigment on capsule of lens. Patient spontaneously said that the eye felt much easier, and had quite lost pain.—Jan. 7th: Left eye: no circumcorneal zone, pupil 8 mm., regular, though he has only been using atropine drops as before since last visit. He says that, though he has had severe rheumatic pains in joints, the eye has not been painful. On using 2 per cent. solution of cocaine left pupil was 8·5 mm., and showed one small posterior synechia upwards and inwards.

CASE 3.—J. H——, aged thirty-two, was admitted March 3rd; syphilitic iritis; has been using atropine for one week. Left eye painful and congested; pupil 5·5 mm., dilated; numerous synechiæ. Two instillations of cocaine, 2 per cent., and pupil 6·5 mm. and regular.—6th: Has been using atropine since last visit. Left eye: no pain, very little congestion; pupil 8 mm., regular. Under cocaine, pupil 8·5 mm.; no synechiæ to be seen.

CASE 4.—C. S——, aged fifty-five, was admitted March

31st. Left eye inflamed for three weeks. Great ciliary congestion in left eye ; iris discoloured ; pupil 3·5 mm., sluggish ; tension normal. Ordered atropine drops (four grains to an ounce), and compress.—April 7th : still pain. Left eye : circumcorneal zone ; pupil 4·5 mm., irregular ; numerous posterior synechiæ. Two instillations of cocaine, 2 per cent. solution, and left pupil 7·5 mm. ; only two synechiæ to be seen ; pain quite relieved.

Case 5.—T. S——, aged thirty-six, admitted April 24th. Right eye inflamed and painful for fourteen days. Right eye : ciliary congestion ; iris discoloured ; pupil 4·5 mm., sluggish, oval. Three instillations of solution of cocaine (2 per cent.) and atropine (four grains to the ounce). Right pupil 7·5 mm., showing two posterior synechiæ ; ciliary congestion much lessened ; great relief to pain. Ordered atropine drops.—28th : No pain. Right pupil, 7·5 mm., regular. Two instillations of cocaine (2 per cent.), and right pupil 9 mm., regular ; no synechiæ to be seen.

Case 6.—J. M——, aged twenty-nine, admitted May 5th. Syphilitic iritis : three years ago primary sore ; fifteen days right eye inflamed. Has been using atropine for one week. Right eye painful ; well-marked circumcorneal zone ; pupil 6·5 mm., dilated, regular ; tension normal. Disc of atropine and cocaine put in ; fifteen minutes after much less pain and congestion ; pupil 7 mm., oval. A second disc was put in, and after ten minutes there was no pain in the right eye ; pupil 8·5 mm., round and regular. Ordered atropine drops.—12th : Right eye still congested and painful ; pupil 6·5 mm. Disc of atropine and cocaine put in, and pupil 8·5 mm. ; showing a posterior synechia to the inner side. Ordered discs of atropine and cocaine.—19th : Has been using the discs regularly since ordered, and has had no pain in the eye. Right eye : very little congestion ; pupil 8·5 mm., regular ; no posterior synechiæ to be seen ; tension normal.

CASE 7.—T. W.——, aged thirteen, admitted May 15th. Right eye inflamed for nine days. Right eye: much congestion; central corneal ulcer; great photophobia; pupil $2\frac{1}{3}$ mm. Ordered yellow ointment, with four grains of atropia, three times a day.—22nd: Right eye, still great congestion; corneal ulcer the same; pupil 5 mm., regular; anterior chamber deep. 3.45 p.m., disc of cocaine and atropine; 3.55 p.m., pupil 6 mm.; 4.5 p.m., pupil 9 mm., irregular, small posterior synechia above. Ordered ointment of atropia, four grains to the ounce, three times a day. —26th: Has had much less pain. Right eye: much less congestion; corneal ulcer smaller; pupil 8 mm., regular; disc of cocaine and atropine, and pupil 9.5 mm., regular.

CASE 8.—J. G——, aged twenty-six, was admitted on June 19th. Gonorrhœa six months ago. Right eye affected then; for the last six days both eyes congested, and left eye very painful. Right eye: old iritis: pupil very irregular; numerous posterior synechiæ. Left eye: marked ciliary congestion; pupil 3.5 mm., sluggish. Ordered atropine drops three times a day.—23rd: Has been using the drops regularly in the left eye, but still has pain. Left eye: circumcorneal zone; pupil 5 mm.; four posterior synechiæ to be seen. Ordered discs of atropine and cocaine.—26th: No pain; scarcely any ciliary congestion. Left pupil 9.5 mm.; one small posterior synechia above. To continue the discs.—30th: No pain; no ciliary congestion. Left pupil 9.5 mm., regular; no posterior synechiæ to be seen.

CASE 9.—F. R——, aged thirty-six, was admitted on June 26th, with syphilitic iritis. Six months ago he had primary sore; three months ago a rash, sore throat, and his left eye inflamed for six days and very painful. Left eye: great ciliary congestion; anterior chamber muddy: pupil 3.5 mm., irregular and sluggish. T $+\frac{1}{2}$: Under atro-

pine the pupil was very irregular, only dilating in the upper half, a broad posterior synechia binding down the lower half of the pupillary border of the iris. Ordered cocaine and atropine discs three times a day, and mercurial treatment.—30th: He has been using the discs four times a day, and after eight discs he says that the pupil became quite normal, and that he lost all pain in the eye. Left eye: very slight circumcorneal zone; pupil 10.5 mm., and regular; no adhesions visible; some uveal pigment just below the centre of the capsule of the lens; tension normal. —July 3rd: to continue discs; no pain; no circumcorneal zone; left pupil 10.5 mm., and regular.—21st: Four days ago he caught cold, and had a fresh attack of inflammation in the left eye, suffering great pain. He had finished all his discs, but obtained some yesterday, and after using four the pain was much relieved. Left eye: slight circumcorneal zone; pupil 10 mm.: slightly irregular from three small posterior synechiæ at the inner side; tension normal. —24th: Left eye: no pain; no ciliary congestion: pupil 10.5 mm., one small adhesion above and to the inner side. —28th: Left eye: no pain; no congestion; pupil 10.5 mm., and regular; no adhesions to be seen. To leave off discs.

CASE 10.—T. B——, aged forty, admitted July 3rd. Says that every three years he has inflammation of eyes; no history of rheumatism, gout, ague, or venereal disease. Right eye: circumcorneal zone; pupil 3.5 mm., very sluggish; ordered atropine drops.—7th: Right eye: still pain and cirumcorneal zone; pupil 5 mm., irregular; posterior synechiæ; tension normal; ordered discs of atropine and cocaine.—14th: no pain. Right eye: very little ciliary congestion; pupil 9 mm.; one posterior synechia below.—21st: Right eye: no pain, no congestion: pupil 9.5 mm., regular; no synechiæ to be seen.

CASE 11.—J. C——, aged twenty-nine, was admitted

July 24. Rheumatic iritis; left eye inflamed for fourteen days. Left eye: great ciliary congestion and pain; pupil 4.5 mm., sluggish; T+½; ordered atropine drops, but to get cocaine and atropine discs if possible.—28th: Used the atropine drops till two days ago, when the patient had great pain and could not sleep, so obtained the discs. He says that after one disc the pain was relieved in half an hour, and that he has been using them four times a day since. Left eye: no pain, very slight congestion, pupil 10 mm., regular; tension normal.—August 4th: No pain. Left eye; pupil 10 mm., regular. To leave off drops. Saw him a month afterwards; eye perfectly quiet; no relapse.

Remarks.—On looking over the notes of the above cases of iritis, treated by the combination of cocaine and atropine, we find the following constant and quickly attained results: great dilatation of the pupil, relief of pain, diminution of ciliary congestion, and decrease of intra-ocular tension when present. Now, in the active stages of iritis, as in inflammation of any other part, we have congestion of the vessels of the iris, and this gives rise to sluggishness, or even to contraction of the pupil, followed often by posterior synechiæ. Therefore any treatment, to be successful, ought to be directed to relieving the iris of blood, and dilating the pupil as quickly as possible, so as to remove the pupillary edge of the iris from the central portion of the capsule of the lens. The pain, which is such a prominent symptom of iritis, is, I believe, due either to the turgid state of the vessels, giving rise to tension of the iris, and so to pressure on its nerves, or to the tension of synechiæ. Considering the physiological action of the drugs employed, we find that atropine produces mydriasis by paralysing the endings of the oculo-motor nerve and the unstriped muscular fibre of the iris, and, according to most observers, by stimulating also the dilating mechanism of the pupil. The

action of atropine on the bloodvessels of the iris is apparently of little importance, as any constricting influence would be quickly followed by dilatation. Cocaine, as I showed in a paper before the Royal Society on June 18th, 1885, acts by stimulating the endings of the mydriatic nerve of the eye, and also by constricting the small bloodvessels, thus producing a very large mydriasis, acting always to the movements of light and accommodation. Thus we see that neither drug produces alone all the effects necessary in the treatment of a case of iritis; but the combination of cocaine and atropine gives us all these—viz., an *ad maximum* dilatation of the pupil, constriction of the vessels of the iris, and inaction of the pupil to light and accommodation. The *ad maximum* dilatation of the pupil produced by this combination keeps the pupillary border of the iris away from the capsule of the lens, preventing adhesions, and also breaks down synechiæ when formed by stretching them, and by constricting their vascular supply literally starves them. From these facts doubtless ensued the excellent results of cocaine and atropine in the cases above enumerated; but I would not, of course, suggest that this combination will have much effect in cases of old complete posterior synechiæ, but rather that we have in it a therapeutical remedy much more potent and certain in action in iritis than atropine. The rapid cessation of pain, which I have always seen follow the application of cocaine and atropine in iritis, enabled me to dispense with blisters and leeches in these cases.